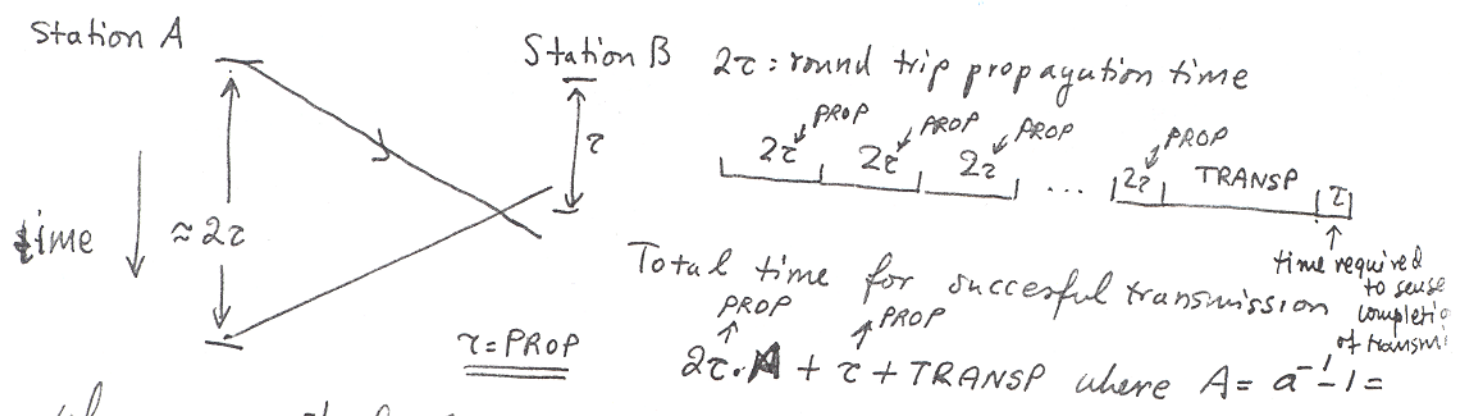


More accurate derivation of the efficiency of the CSMA-CD.



where $a \approx e^{-1}$ for large number of stations!
 Hence ~~total~~ ^{mean} time to successfully transmit = $\text{TRANSP} [1 + r(1 + 2(e^{-1}))]$
 where $r = \frac{\text{PROP}}{\text{TRANSP}}$

Hence efficiency $\eta_{\text{CSMA-CD}} = \frac{1}{1 + r(1 + 2(e^{-1}))} \approx \frac{1}{1 + 4.43r}$

Now 1 message takes on the average $\text{TRANSP} [1 + 4.43r]$ time units to be transmitted therefore on the average we can transmit

$\frac{1}{\text{TRANSP} [1 + 4.43r]}$ packets/time units.

If we have an ^(total) arrival rate of λ packets/time unit then

$\lambda < \frac{1}{\text{TRANSP} [1 + 4.43r]} \Leftrightarrow \lambda \cdot \text{TRANSP} < \frac{1}{1 + 4.43r}$

We can view $\lambda \cdot \text{TRANSP}$ as the normalized arrival rate i.e. packets arriving per packet transmission interval! We denote $\rho \triangleq \lambda \cdot \text{TRANSP}$

Note: Another look at the efficiency: $\eta = \frac{\text{TRANSP}}{\text{TOTAL TIME FOR TRANSMISSION}}$

$= \eta = \frac{1}{\frac{\text{TOTAL TIME FOR TRANSMISSION}}{\text{TRANSP}}} = \frac{\text{effective rate.}}{\text{rate offered.}}$ i.e. line rate (March 2000)

Important!

As an example if $a=0.1$ we have $p \leq 0.69$

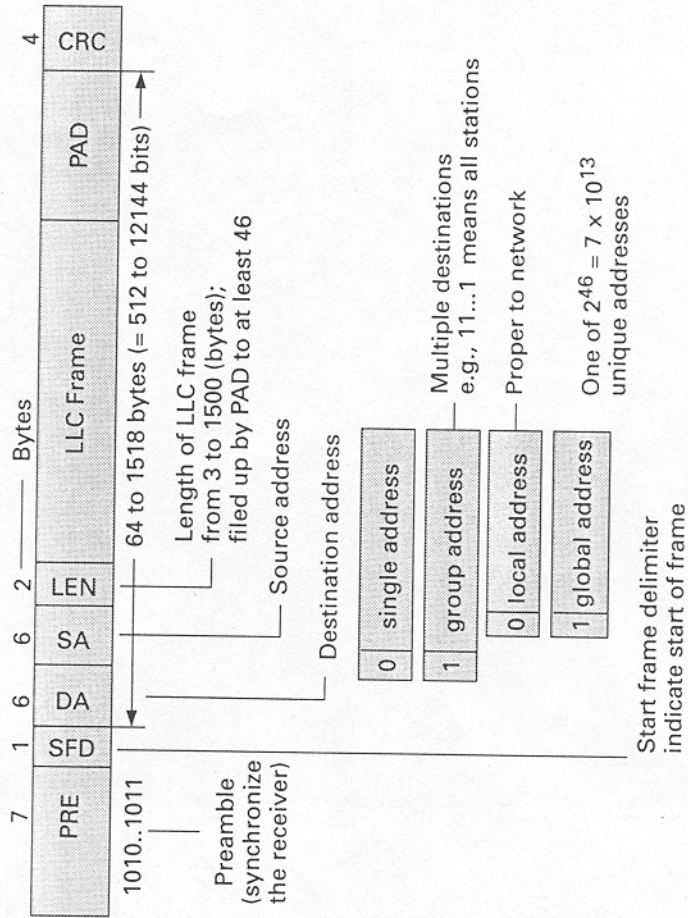
The pure aloha has $p=0.18$ and the slotted aloha $p=0.36$

For the case of $a=0.1$ and a propagation delay $\tau = 180 \mu s$

(corresponding to a metropolitan area network of distance $\sim 10 \text{ km}$)

we get $T_{\text{TRANSP}} = 1.8 \text{ ms}$. If the packet carries 128 bits then

the transmission rate is $\frac{128}{1.8} \approx 70 \text{ Kb/s!}$



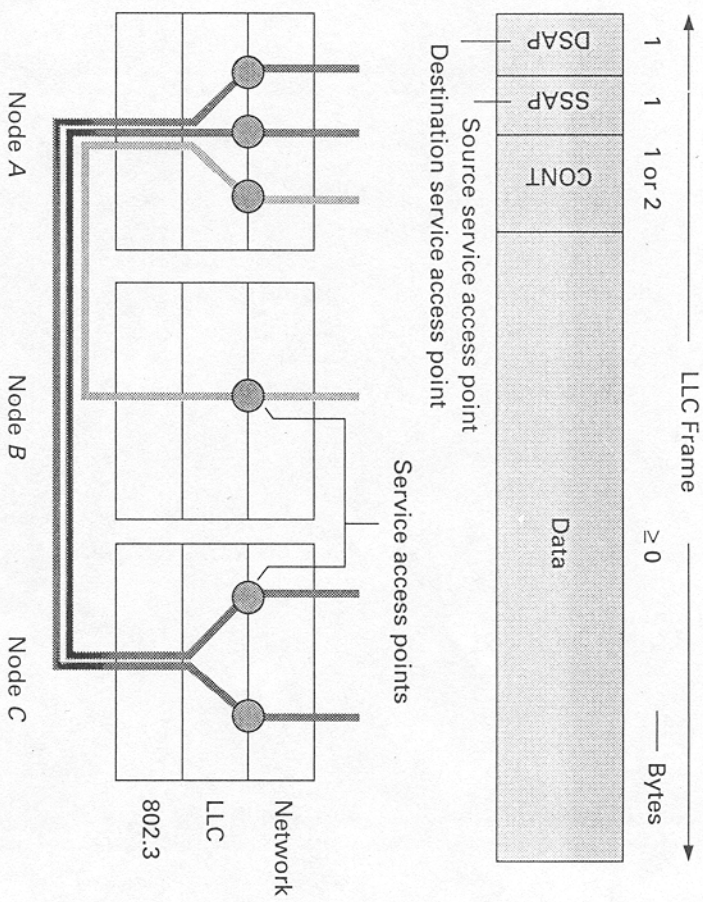


Figure 5.10 IEEE 802.3 frame structure.

The figure shows the frame structure for IEEE 802.3 networks. The destination address is either a single or a group address, and it is either local or global. The padding field guarantees that the minimum valid frame contains 68 bytes after the SFD.

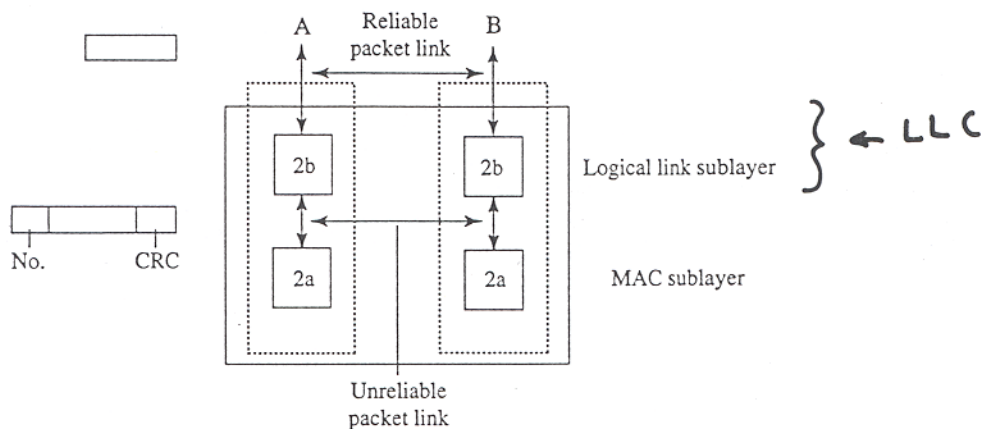


Fig. 3.4 (Walrand)

LLC provides:

- * Connection Oriented services → { uses CRC field for error detection.
Uses GO Back N protocol.
- * Connectionless (Acknowledged or NOT!) services

LLC can multiplex different transmissions that are differentiated by the service access point field

LLC does transparent routing between Ethernets that are attached together.